

Polymer Derived Rare Earth Silicate Nanocomposite Protective Coatings for Nuclear Thermal Propulsion Systems, Phase II

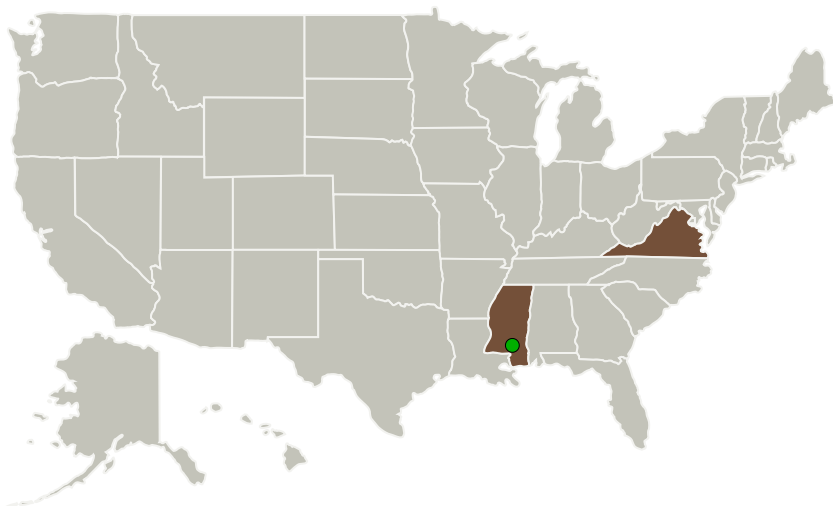
Completed Technology Project (2014 - 2016)



Project Introduction

Leveraging a rapidly evolving state-of-the-art technical base empowered by Phase I NASA SBIR funding, NanoSonic's polymer derived rare earth silicate EBCs will provide a paradigm breaking advancement for NTPs by extending the operational utility of NTP rocket thrust chambers and nozzles. Unlike competing deposition technologies severely limited by substrate size and dimensions, NanoSonic's rare earth silicate coatings may be spray deposited under ambient conditions onto large area complex substrates and converted to mechanically robust, thermally insulative EBCs on a production basis. In fact, legacy spray equipment employed for hardcoat deposition within the marine, automotive and aerospace industries has been used for successful EBC deposition. Simulated NTP testing completed by the University of Washington on coated Inconel 625 substrates indicate five candidate EBCs have exceptional environmental, dimensional, and adhesive durability within flow conditions representative of NTP rocket engines. In fact, zero spallation, erosion, or any other form of coating degradation was observed at the thermal limit of testing of 1,950 C. All candidate resins may be transitioned to 200-gallon batch production quantities within an established manufacturing infrastructure.

Primary U.S. Work Locations and Key Partners



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| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|-------------|-----------------------------------|
| Nanosonic, Inc. | Lead Organization | Industry | Pembroke, Virginia |
| ● Stennis Space Center(SSC) | Supporting Organization | NASA Center | Stennis Space Center, Mississippi |

| Primary U.S. Work Locations | |
|-----------------------------|----------|
| Mississippi | Virginia |

Project Transitions

▶ **April 2014:** Project Start

✓ **April 2016:** Closed out

Closeout Summary: Polymer Derived Rare Earth Silicate Nanocomposite Protective Coatings for Nuclear Thermal Propulsion Systems, Phase II Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/137624>)

Images



Briefing Chart Image

Polymer Derived Rare Earth Silicate Nanocomposite Protective Coatings for Nuclear Thermal Propulsion Systems, Phase II
(<https://techport.nasa.gov/image/132039>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanosonic, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

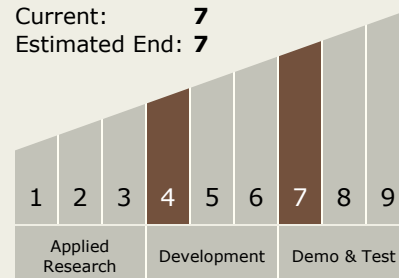
Carlos Torrez

Principal Investigator:

Victor V Baranauskas

Technology Maturity (TRL)

Start: 4
Current: 7
Estimated End: 7



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System